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ORIGINAL ARTICLES.

THE ANTISEPTIC AND GERMICIDAL PROPERTIES OF THE SILVER SALTS AND PREPARATIONS.*

BASED ON WORK DONE AT THE HYGIENE INSTITUTE, BERLIN—
DIRECTOR GEH. PROF. DR. RUBNER.

By MARSH PITZMAN, M.D.,
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In the course of experimental work on bichloride of mercury my attention was attracted by peculiarities in the antiseptic and germicidal powers of the various silver combinations. These, to me at least, unsuspected antiseptic powers were not satisfactorily explained in the literature, as for example the old observation that egg beaten up with metallic silver will not spoil, etc., etc. (S.v.d. Does; Arch. f. Physiol. Chem., Bd. 24, S. 351). Therefore, I determined to carry out parallel experiments with the silver and mercury salts, to see whether perchance I could reach the roots of the matter. These results I now bring before this section in the hope that they have theoretical or practical value. Specifically this work contains points that might well be advanced for or against certain arguments of the last general conference on the subject at Los Angeles.

The germicidal power of the bichloride of mercury and nitrate of silver in aqueous solutions is justly and universally recognized as high. (First scientifically proven by Koch, R: a.d.k. Gsudhts. Amt., 1882 I). Parenthetically, I might add they are only surpassed by the free halogens (chlorine, bromine or iodine) which have the added power of killing the most resist-

*Read at the meeting of the Ophthalmological Section, St. Louis Medical Society, Dec. 6, 1911.

ant spores practically instantaneously (Geppert. Berl. klin. Wchnschr., 1890, No. II).

When bichloride of mercury or silver nitrate are added to albuminous mixtures it is a recognized fact that they lose greatly in antiseptic and germicidal power (v. Behring: *Bekämpfung der Infections-Krankheiten*, Leipzig, 1894). The word antiseptic is used in its strict sense—*entwicklungshemmend*—growth checking. Why do they lose so in power?

v. Behring maintained, p. 52 (translated), "If therefore on the part of surgeons the opinion is expressed that bichloride of mercury, as soon as it comes into contact with albuminous fluids, is no longer bichloride of mercury, but undergoes chemical changes—that is correct. But on the ground of special experiments on the question, the oft expressed view that through that the mercury salt loses its germicidal action, I believe cannot be too strongly opposed."

Paul and Kroenig give the following reason (*Zeitschr. f. Hyg.* 1897, Bd. 25, S. 112), "In bouillon, gelatine, body fluids, etc., the germicidal power of the metal salts is in general less than in pure water. It is probable that this decrease in germicidal power is to be explained by a decrease of the concentration of the metal ions."

No later, clearer or more authoritative reason has found its way into the reference books (*Handbuch der Pathogenen Micro-Organismen*, Jena 1904. Kolle und Wassermann, Vol. IV, Part I, Disinfection by Prof. E. Gotschlick). My own explanation differs from these as you will find from the body of the paper.

If bichloride of mercury is added to blood serum so as to represent definite dilutions, it is found that less than 1/10000, it has no antiseptic or germicidal action on the ordinary pyogenic bacteria, staphylococci or streptococci. If bichloride is present in greater strength it exerts a germicidal action as per table.

Table I.

Blood Serum		1st day	2nd day	3rd day	7th day
Bichloride of mercury	control	+	+	+	+
	1-16000	+	+	+	+
	1-12000	+	+	+	+
	1- 8000	—	—	—	—
	1- 6000	—	—	—	—

+ = life and growth microscopic; — = death.

The technic, number of experiments, etc., are printed in full in the original article (Ueber das desinficierende Verhalten des Sublimats und Silbernitrats in Eiweisshaltigen Fluessigkeiten—Hygienische Rundschau, No. 12, 1909) so will not be taken up here.

If now using parallel technic we add silver nitrate to blood serum in measured dilutions, then inoculate with staphylococci or streptococci and incubate at optional temperature for a week (37°C), we get this result.

Table II.

	Blood Serum	1st day	2nd day	3rd day	7th day
	control	+	+	+	+
	1-35000	O	+	+	+
Silver	1-24000	O	O	+	+
Nitrate	1-16000	—	—	—	—
	1-10000	—	—	—	—

+ and — as before; O=life, but no growth.

The circles evidently represent tubes that are restrained temporarily from growth by some antiseptic force and are not represented in the parallel bichloride group..

If we use the same technic with the single change that the blood serum is diluted four times with water, we get the following result:

Table III.

	Blood Serum $\frac{1}{4}$	1st day	2nd day	7th day
	control	+	+	+
	1-64000	+	+	+
	1-48000	+	+	+
Bichloride of	1-36000	—	—	—
Mercury	1-24000	—	—	—
	control	+	+	+
	1-120000	+	+	+
	1-100000	+	+	+
Silver	1- 70000	—	—	—
Nitrate	1- 40000	—	—	—

If again with the same technic, blood serum diluted eight times, results are as follows:

Table IV.

Blood Serum $\frac{1}{8}$		1st day	2nd day	7th day
control		+	+	+
Bichloride of Mercury	1-128000	+	+	+
	1- 96000	+	+	+
	1- 64000	—	—	—
	1- 48000	—	—	—
control		+	+	+
Silver Nitrate	1-250000	+	+	+
	1-180000	+	+	+
	1-140000	—	—	—
	1- 80000	—	—	—

In the foregoing tables we now have data for reflection. Obviously the single fact of water dilution does not answer the question, for by selection we find 1-64000 bichloride albuminous fluid in Table IV acting as germicide, whereas Table I, 1-12000 is ineffectual; 1-140000 silver nitrate in Table IV kills the bacteria, whereas in Table II 1-24000 fails to show germicidal power.

But we *do* find a very definite relation between the quantity of the chemicals and of albumin, and the resulting germicidal power. *Mid.*—results are taken for the sake of easy comparison.

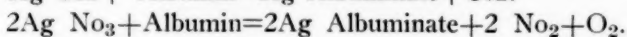
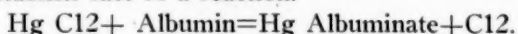
Table V.

	Normal serum	diluted $\frac{1}{4}$	diluted $\frac{1}{8}$
Bichloride of mercury	1-10000±	1-40000±	1- 80000±
Silver nitrate	1-20000±	1-80000±	1-160000±

± means a turning point—slightly less the bacteria will grow, slightly more they will be killed.

To reach a ± point a fixed amount of bichloride or silver nitrate is required to combine with a definite amount of albumin. If the albumin is diluted four times then only one-fourth the amount of bichloride or silver nitrate is required to reach this ± point; if eight times, then only one-eighth of the amount. This ± point established bacteriologically is not possible to determine, so far as I could find out, by direct chemical means. By

the chemical laws of multiple proportions we deduce that this reaction must take place. Multiple proportions, I might explain, establish fact of a reaction.



With this conception in mind we may well reconsider Table I. When bichloride is added it combines with the albumins to form an albuminate and the chlorine rapidly forms combinations disappearing as a free gas from the mixture. The chlorine is, I take it, the real germicide, the mercury acting merely as the carrier. Mercury albuminate shows absolutely no sign of antiseptic action against the staphylococci or streptococci, for the mercury albuminate grew as rapidly as the controls. When all the albumin affinities are satisfied, the excess bichloride exists free in the fluid and exerts its powerful germicidal action. The \pm point represents the point at which the mercury albumin affinities are saturated.

In Table II. when silver nitrate is added it combines likewise with the albumins to form an albuminate, and the nitrous oxide + oxygen rapidly disappear as free ions from the mixture. Nitrous oxide and oxygen are, I take it, the real germicides, the silver acting as carrier. Silver albuminate shows definitely its antiseptic action on the growth in tubes marked with a circle. Obviously that restraining of growth was not accomplished by excess silver nitrate, for that would rapidly have acted as a germicide. Further the later experiments (Tables III. and IV.) with greater dilutions correspond with a dilution of about 1-20000. When all the albumin affinities are satisfied, the silver nitrate exists free in the mixture and exerts its strong germicidal action.

As the addition of bichloride and silver nitrate to egg albumin undiluted illustrates several points well, we will take up briefly that table.

Table VI.

Chemical	Dilution	Days.					
		1st	2nd	3rd	4th	7th	30th
Bichloride of Mercury	Control	+	+	+	+	+	+
	1-1600	+	+	+	+	+	+
	1-1200	+	+	+	+	+	+
	1- 800	—	—	—	—	—	—
	1- 400	—	—	—	—	—	—
Silver Nitrate	Control	+	+	+	+	+	+
	1-3200	+	+	+	—	—	—
	1-2400	+	+	—	—	—	—
	1-1600	—	—	—	—	—	—
	1- 800	—	—	—	—	—	—

Even in these great concentrations the mercury albuminate fails to show any trace of antiseptic action. The antiseptic action of the silver albuminate is well shown by the gradual death of the bacteria.

PRACTICAL CONSIDERATIONS.

In the light of this data the time honored belief that bichloride of mercury applied externally over a suppurative wound exerts an antiseptic action on the bacteria in the tissues appears untenable. In the presence of albuminous fluids bichloride must exist as a free excess in order to show any action. Then it would immediately act as a germicide, not as an antiseptic. I have taken up this point in full detail in the *Journal of A. M. A.*, Vol. LV., No. 4, (July 23, 1910). (Also *Journal Missouri State Assn.*, Vol. VII., No. 5, Nov., 1910.) The recurring attempts to influence general sepsis by the injection of bichloride of mercury such as Bacelli's, etc., etc., must be futile.

By reference to Tables II. and VI. it is plain that two classes of silver albuminates are present. Firstly, those in which silver albuminates are present without free excess silver nitrate; secondly, those in which silver albuminates are present with excess silver nitrate. Therapeutically we find both classes represented as is demonstrated by the work of the Commission appointed by the British Medical Assn. (Marshall and Macleod Neave, *Brit. Med. Journal*, 1906, 18 Aug.). To the first class belong two preparations, collargol and argyrol, good antiseptics

but poor germicides, killing staphylococci only at end of ten hours—obviously the foregoing proves a class without excess free silver salt. To the second class belong protargol, ichthargan, albargin, novargan, etc., etc., which are strong geremicides, killing staphylococci within minutes—obviously a class with excess free silver salt. I cannot see how this second class can have any practical advantage over the simple dilutions of the silver salts.

These facts show why protargol, ichthargan, albargin, novargan, etc., etc., can be substituted clinically for dilute solution of silver nitrate without loss of power (or gain, as I am convinced). But they also bring out the fact that argyrol and collargol belong to an entirely different class. They are in no sense of the words indifferent substitutes for silver nitrate. The Credé prophylaxis of ophthalmia neonatorum called for an active germicide—free excess silver nitrate, therefore collargol or argyrol are not indifferently to be substituted.

Credé's attempt to use the antiseptic power of silver albuminate in cases of general sepsis—it shows decided power at 1-35000 in blood serum as per reference to Table II.—was a most reasonable effort. The honest work of Dr. Cohn (*Ueber den antiseptischen Wert des Argentum colloide Credé und seine Wirkung bei Infectionen, Centralbl. f. Bakt. Orig. Abt. I, 1902, Bd. 32, S. 744*) showed, however, that it was rapidly thrown out of the blood and convincingly proved its inefficacy in animal experiment.

A word in closing in regard to the literature. Regard with the greatest suspicion antiseptic and germicidal values proven on the gonococcus. This organism must live on human secretions—is too sensitive for such work as it dies off in culture without apparent cause. Honest work is often rendered valueless, the error constantly recurring, as silver is allowed to come into reaction with common salt, resulting in the formation of silver chloride. Silver chloride is insoluble and has no antiseptic or germicidal power (Personal experiments, unpublished).

The silver preparations represent the widest known range of activity from absolutely nil through various antiseptic gradations to most powerful germicides—the range depending upon the combination in which the silver exists.

The practical application of these principles. For the present at any rate I have ventured enough, so leave that confidently where it belongs, in the hands of the oldest specialty of our profession.

GUMMATOUS INFLAMMATION AT THE INNER CANTHUS, SIMULATING DACRYOCYSTITIS.*

CASE REPORT.

By W. H. LUEDDE, M.D.,
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Mrs. Z., aged 36, came to my office July 20th, 1911, with the history of an "abscess of the corner of the left eye", of four or five weeks duration. Her family physician had first referred her to a dispensary where she was treated for a dacryocystitis for the last ten days. The progress in the case not being satisfactory, she was then referred by him for private treatment.

Examination showed what appeared to be the swelling caused



by an ordinary inflammation of the lacrimal sac, except that the bulk of the swelling was higher than usual. However, I accepted the diagnosis already made almost without question and proceeded to irrigate the lacrimal sac from the upper canaliculus, the upper punctum having been slit at the clinic. To my surprise there was a free passage of the fluid into the nose, also some of it passed out through an opening in the skin, which had

*Reported to the meeting of the Ophthalmic Section, St. Louis Medical Society, January 3, 1912.

been made at the clinic, directly over the swelling above the inner canthus. The free drainage of which we were thus assured made it likely that there would be a prompt subsidence of the swelling with entire relief. The irrigations were continued regularly, small doses of potassium iodide (5 grs. t.i.d.) were given on general principles, but the patient did not improve. After three weeks, she even seemed to be getting worse. Nodular swellings (See Fig.) appeared at the lower punctum as well. The solutions no longer passed to the nose. Even the passage of fluids through the canaliculi was uncertain. The cutaneous incision instead of healing became necrotic as did the slit in the upper canaliculus. A consultation with her physician now revealed the fact that her mode of life was irregular. That, while he had never treated her for it, it was quite possible that she had at some time acquired syphilis.

The potassium iodide was therefore rapidly increased to tolerance while no change was made in the local treatment. The case promptly cleared up. In two weeks very slight swelling remained. the secretion had entirely stopped, the cutaneous wound had healed, and the patient considering herself well no longer presented herself regularly for treatment. Two months later she was still doing entirely well. Four months later there was no local trouble except the cutaneous scar. At that time, on irrigation by either upper or lower punctum, the solution passed freely into the nose.

It is evident that we were here dealing with a gummatous process springing from a latent lues of long standing. The location of the trouble together with the subjective symptoms (overflow of tears, excessive secretion, swelling, etc.) and the rarity of luetic processes of this type obscured the diagnosis. The freedom of the lacrimal passages from any obstruction as shown by the free passage of the irrigating fluid at the beginning as well as the higher location of the swelling should have raised the question at once, except for the absence of any history of lues.

The fact that the patient continued to get worse under small doses of K I and then recovered rapidly under large doses without any other modification in the treatment, is a lesson in the therapeutics of this drug which needs no further comment.

I regard the cutaneous incision made in this case as a mistake.

The routine and unhesitating resort to this method of draining a lacrimal abscess in dispensary practice is deplorable. A little patience and care will usually enable the operator to get sufficient drainage in the regular channels without producing permanent scars of the face. The prompt closure of fistulous openings in old neglected cases, as soon as drainage by the proper channels has been established, should indicate how uncalled for this method of opening these abscesses by cutaneous incisions really is.

TRANSLATIONS.

THE ACTION OF RADIUM AND RADIUM EMANATION ON THE VISUAL APPARATUS.*

BY PROFESSOR DR. H. CHALUPECKÝ.

(Translated by Adolf Alt, M.D.)

Soon after Roentgen's discovery Becquerel found the radiation of the uranium salts. Studying the Joachimsthal uranium ore Curie and wife then discovered three radio-active substances; radium, actinium and polonium; of this radium is the most important substance; it is an element somewhat related to barium and has an atomic weight of 226. Its salts, the bromide and the chloride, are used in practice.

The powerful biologic action of the radium combinations is of the greatest importance in medicine. Its deleterious effect on the skin and nervous system is well known. A prolonged irradiation in animals with strongly active preparations caused, besides ulcerations of the skin, spasms, paraplegia, ataxia, etc. By its influence upon the nervous system we can explain the analgesic action of radium on painful parts, for instance, in neuralgias. In general, we may say that no organ of the body remains uninfluenced under a prolonged irradiation with radium: the lymphoid cells of the spleen and bone marrow disintegrate, in the testicles the canalicular epithelium dies, in the ovaries the Graafian follicles atrophy, the nerve fibres become atrophic, in

*Wiener Klin. Rundschau, No. 52, Dec. 24, 1911.

the liver and kidneys the cells die, the muscular tissue breaks down. The glands suffer comparatively less, yet the parenchyma is replaced by connective tissue. Further on its bactericidal action was established, at for certain microbes.

The visual apparatus was subjected to an experimental study by London (1904);¹ he irradiated mice and rabbits with 30 mg. radium bromide for several months. Aside from ulcers of the skin, paraplegia, loss of sexual function and loss of flesh, he found in some of the animals (perhaps those who had oftener looked at the radium container fastened to the cage) inflammation of the retina and optic nerve, and profuse secretion from the conjunctiva. Cornea and lens were least affected. At the same time Birch-Hirschfeld² made exhausting experiments; he fastened a capsule containing 20 mg. radium bromide directly to the eyelid of a rabbit and thus caused in a few hours a dermatitis with loss of hair, conjunctivitis, opacity of the cornea, iritis and sometimes alterations in the retina and optic nerve. The lens remained unchanged.

Lately (1911) I have repeated these experiments at the physical institute of the Bohemian University at Prag with the kind assistance of Professor B. Kucera. I had only 5 mg. of the radium salt at my disposal enclosed in a capsule covered with mica. This capsule was for one to two hours fastened on the eye of the rabbit with the mica covered side against it, either daily or every other day or with an interval of several days. After an irradiation of about eight hours conjunctivitis appeared; after seven hours further exposure the palpebral conjunctiva was greatly swollen and its surface covered by a deposit, the cornea was smoky, the iris unchanged, the pupil contracted. After further sessions this condition did not grow any worse. The ophthalmoscope showed nothing. Now the animal was decapitated and lids and eyeball were examined microscopically. We found the following; the epithelium is irregular with here and there a superficial loss of substance; the layers of the cornea are irregularly arranged, as if bent; a slight infiltration in the superficial layers and numerous small lacunæ, as if the layers had been forcibly separated; in the remaining portions of the cornea an undoubted increase in fixed cells; no newly formed bloodvessels; Descemet's membrane uninjured. The iris and other parts are free from alterations, especially the lens is transparent and the retina of normal structure.

On the whole, the changes found in my experiments are less intense than those obtained and described by Birch-Hirschfeld. This can probably be explained by the weaker radium preparation. A similar difference was found in the degree of the changes obtained in experiments with Roentgen rays, which I made as the first with a quite incomplete apparatus and Birch-Hirschfeld a few years later under the best possible conditions. Then, too, I found³ inflammatory processes in the anterior parts while Birch-Hirschfeld, also, found alterations in the optic nerve and retina. I explained the difference by the different apparatus. Yet, I have learned that other experimentors have found no alterations in the optic nerve and retina. There are especially Tribondeau and Lafargue⁴ who directly declare Birch-Hirschfeld's pictures (after Roentgen rays) to be either artefacts or a mistaken explanation; Schoute⁵ states that he did not find any changes in the fundus, even after prolonged application of radium.

The changes in the irradiated tissues soon led to therapeutic experiments. The application is either made in the manner that the capsule containing the radium is laid on the diseased part (the mica downwards) while its neighborhood is protected with sheet lead—instead of the mica very thin aluminum plates are also used which are quite permeable to the rays, or celluloid plates or the radium salt is rubbed on a plate and fixed there with a special varnish which absorbs only about 10 per cent. of the rays.

The curative results with tumors and skin diseases do not belong here. In general the results are good and are frequently highly valued according to operator's subjective opinion.

In ophthalmology trachoma was selected as object for curative experiments. Every second day the conjunctiva of the eyelids was stroked with a glass tube containing the radium preparation or with a plate covered with radium varnish. The results have frequently been praised, the subjective symptoms were said to recede, the granules to disappear and the cornea sometimes to clear up. On the other hand authors like Wicherkiwicz, Birch-Hirschfeld, Jacoby and others find no advantage in the radium therapy as against the usual therapy. This difference in experience can well be understood in view of variations in the course of a trachoma. When stroking the conjunctiva we

must not forget the purely mechanical massage which, too, is sometimes successful if done with a glass rod or glass tube without any radium.

Darier⁶ in most varied eye affections laid the radium on the eye or temple. He states that he saw reduction in pain, cure of vernal conjunctivitis (which as is known disappears also without treatment); in cases of intraocular hæmorrhage, of glaucoma and detachment, too, he says that he saw an improvement, especially a more rapid absorption of exudates, but by far not in all of the cases.

Furthermore Lawson and Davidson, Schoute, and Koster praise their results.

Very likely the high price of radium was not the last reason why therapeutists began to consider the active gas given off by the radium, the emanation.

Radio-active substances and with them the emanation are actually everywhere in small quantities; especially in the different springs the radio-activity seems to be very strong and is chiefly due to the emanation contained in them and not to a solution of radio-active salts. Thus, for instance, in the strong Joachimsthal water no radium salts were found by J. Step.⁷

By introducing radio-activity even water can be rendered radioactive; the effect, as found by experiment, is the same.

The introduction of radioactive substances into the organism can be accomplished in several ways. Drinking the radioactive water seems the most natural, but has little effect; the absorption by the skin when bathing in it is also of little value. The largest effect is produced by inhaling the emanation from the water. To this end emanatoria have been constructed, well closed spaces in which the emanation gases are inhaled from apparatus which serve for the production of the emanation.

Another method is the injection of radioactive fluids. Injections of a strongly activated physiological salt solution into tumors had only a mediocre effect.

By whichever of these three methods the emanation has been introduced, it very quickly leaves the organism, within a few minutes even, with the expired air; minute traces have been found in the urine. Yet, in spite of the shortness of the activity the blood carries the emanation into the cells of the organism where the remains of the products of the broken down emanation exert their biologic effect.

In order to convince myself of the influence of radioactive water upon the eye, I chose the injection method. The Government officials at my request permitted me to buy one kilogram of uranium ore from the Joachimsthal office. I first examined its effect on a photographic plate. I laid a piece of it with its ground and polished surface on a well wrapped photographic plate for 36 hours. This gave a distinct picture of the radioactive parts between the inactive portions. Then I poured 30g. of the powdered uranium ore into 70 cubic cm. of distilled water and examined the degree of activity in periods of a few days by means of an electroscope. About 2 cubic cm. of the water were put into a small metal dish attached to the apparatus, then the divergence of the blades was observed and compared with the natural divergence (in the open air) and then with "the norm". For this we used a leaf of paper which had been dipped into a radium bromide solution and then covered with wax. In this way we found that the activity of the water increased continually until after 40 days it was equal to the norm. It is only necessary to measure the strength according to the unit of Mache. For this a comparison with artificially radioactive water from the factory of radioactive products at Neulengbach served us well. This factory selected as a practical unit the activity of the Grabenbäckerquelle at Gastein. 200 liter from this spring according to careful analysis possess 31,000 Mache units. This activity the factory calls a "Gastein"; from this it follows that $\frac{1}{4}$ Gastein possesses 7,750 M. units and that the strongest product, the eightfold Gastein, has 248,000 M. units. First we examined $\frac{1}{4}$ Gastein and found by electroscopic measure that our water made radioactive by the uranium ore was almost as strong, that it equaled the Karlsbad iron spring and that it was a little stronger than the hot Mühlbrunn.

As stated above, the injection of radioactive water seemed to me the best method for studying its effect on the eyes. For this, however, it is necessary to have aseptic fluids, and since the radioactive water must not be boiled, and the addition of any antiseptic substance would complicate the effect, it is very difficult to sterilize the water. However, when we think that radium rays have bactericidal properties (as, for instance, Goldberg has proven by irradiating cultures) and that the emanation, too, is sterilizing, we can conclude that a strongly radioactive water

is not likely to cause an infection after the injection. Of course, only a trial can decide this.

Our water, originally distilled, activated by the uranium ore was subjected to the most unfavorable conditions; powdered uranium ore was poured into the water without any preparation, therefore certainly unclean; during the repeated trials as to its activity a certain amount of this water was removed and then poured back; the bottle had only a simple glass stopper, etc. In spite of all this we found that when 1 cubic cm. of this water was put into bouillon a slight turbidity occurred on the fourth day and no pathogenous microbes were found.

This having been learned I made my first experiment on a rabbit and injected subconjunctivally 1 cubic cm. The next day the fluid had been altogether absorbed, the eye was free from any reaction, the external and intraocular examination showed nothing abnormal. Thus the result was negative and proved only that the injected radioactive water had produced neither an infection nor an appreciable irritation.

Further experiments I made with water of greater strength which came from the factory at Neulengbach and was labeled as eightfold, Gastein with 240,000 units. The injection was made under the rabbit's conjunctiva and also through the sclera and the other eye membranes directly into the vitreous body. In these experiments, too, no infection occurred. The infiltration under the conjunctiva was absorbed almost without reaction in 24 hours. After injections into the vitreous body ($\frac{1}{2}$ — $1\frac{1}{2}$ cubic cm.) a pressure opacity developed in the cornea at once with increasing intraocular pressure and opacity of the vitreous body. This diffuse opacity of cornea and vitreous body disappeared after a few days and the ophthalmoscope then revealed either only a few lines which ran from the puncture wound into the vitreous body or a partial retinal detachment at the same place. In one case only the lens, too, became soon opaque; maybe that the posterior lens capsule had been wounded.

The results of these experiments do not differ materially from those of injections with sterile water. Biologically surely the emanation contained in the water should have some action and the question is whether the emanation after the injection could be recognized in the eye. As stated, the emanation disappears

very rapidly from the organism; it would, therefore, be necessary to look for its traces in the eye at once after the injection of the radioactive water. In case of a positive result, it might be argued that we had found the activity of the injection fluid suspended in the eye. Therefore, we allowed 20 to 30 hours to lapse after the injection, until the subcutaneously injected fluid had been completely absorbed and we could assume that the absorption within the eye, too, was accomplished. The animal was then decapitated, the eyes were enucleated and at once examined with the electroscope. First the eye as a whole was examined; the divergence of the blades was the same as with the "norm", that is, no activity was found. Then the conjunctiva at the site of the injection was cut off and examined separately; the result was undecided, it seemed as if there was a slight degree of activity, but it was not certain. Then the eyeball with the injection into the vitreous body was cut open; the eye membranes showed no activity, but the ground up vitreous body was *decidedly radioactive*, if to a low degree. We may perhaps explain this fact by the following reasoning. It is known that the radium radiation is a composite one and that in the main three kinds of rays can be differentiated: (1) rays which consist of particles of the size of atoms (Alpha-rays) and are charged with positive electricity; (2) rays consisting of very small particles, electrons, charged with negative electricity (Beta-rays); (3) rays which originate in the movement of the ether, are not influenced by the electric pole, proceed in a straight line and are similar to the Roentgen rays (Gamma-rays). The first ones are retained by the thinnest aluminum plates, even by paper and glass, half of the second ones are absorbed by an aluminum plate 0.5 mm. thick; the third ones pass through 7 cm. of aluminum and through a lead plate. When radium bromide is used enclosed in a capsule only the second and third kind of rays pass through it, the first kind cannot penetrate the capsule.

The emanation is an inconstant gas; giving off alpha-rays it breaks up so quickly that only half of it remains after 3.8 days. The products of disintegration are solid substances which mostly do not remain long in existence and successively pass over into each other giving off rays all the time. Thus the products radium A, radium B and radium C last only a few minutes; radium D is much more persistent since half of it disappears only in about

16 days; during this time it gives off beta-rays continually.⁸

The emanation contained in the radioactive water disintegrates after having been injected into the vitreous body and disappears. Since in our experiments the animal was killed after a comparatively short period (about 2 days), evidently a part of the emanation remained in the vitreous body which is firmly surrounded by the eyemembranes. The alpha-rays coming from the emanation cannot penetrate the walls of the eyeball and therefore the whole eye showed no radioactivity. When, however, the vitreous body taken out of the eyeball was examined with the electroscope the action of the alpha-rays, which among all the rays ionize the air the most, was quite plain. The penetrating beta-rays which are given off by the disintegration product radium D had not yet acted since on account of the shortness of time the disintegration of the emanation had probably not progressed far enough.

This is the end of my attempts at an experimental solution of the interesting question of the biological influence of radium and the radioactive waters on the optical apparatus. My results are not very important in view of the treatment of eye affections. They confirm the irritation of the anterior segment of the eyeball by the radium radiation, which is analogous to the influence of the Roentgen rays and reminds one of the alterations produced by ultraviolet rays. The radioactive waters produce no special direct effect on the eye. In how far the general treatment with baths and inhalations by the amelioration of the original systemic disease (for instance, gout) will act on the eye, it is impossible to-day to decide.

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2. Archiv. f. Ophth. Vol. LIX.
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4. Accidents oculaires provoqués par l'électricité, Bruxelles, 1909.
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8. This product, radium D, according to Gudzent, changes the mononatriumurate into soluble salts and has therefore a curative action in gout.

MEDICAL SOCIETIES.

MEETING OF THE OPHTHALMIC SECTION

ST. LOUIS MEDICAL SOCIETY,

November 1, 1911.

Dr. H. M. Post, presiding.

Dr. F. E. Woodruff presented a patient with the following history: A child, five years of age, came to the Washington University Eye Clinic about two weeks ago. A nurse who had been called in to attend another member of the family had observed a white reflex in the patient's left eye and called the parents' attention to it. Family history good. No history of any serious illness, except an attack of typhoid two months ago which was followed by an uneventful recovery, and no complications, unless this eye condition be one.

The eye as you see it does not need describing. One thing that deserves notice is the pupillary reaction in the right eye when the left eye is illuminated.

I noticed on the first day some retinal reflex at the upper and nasal as well as on the temporal side. There is none on the nasal side now, nor did I see any after the first day. The other eye appears normal in every respect, and has normal vision.

Dr. Barck: I think the exact diagnosis in this case can hardly be made now, but possibly at a future time. The picture is certainly not one of glioma such as we usually see it. Excluding glioma, the diagnosis lies between metastatic infection of the vitreous body, commonly called metastatic choroiditis, and an entozoon. Of course we ought to know more about the typhoid fever which the patient is supposed to have had. So far we have only the statement of the father. Typhoid, like other infectious diseases, may cause metastatic affection of the vitreous body, but it is more or less of a purulent character, accompanied by inflammatory symptoms. Such have been wanting in this case, as far as the history goes. Furthermore, in metastasis from infectious diseases, the color of the infiltrate in the vitreous

body is yellowish, whilst here the color appears to me to be whitish-gray without any yellow tint.

Dr. Post: In a case of retinal detachment we would probably find some of the retina normal, whereas in this case we can see no normal retinal.

Dr. Ewing: I remember opening several pathological specimens in the University at Kiel in which the vitreous body had this appearance in places. It was called an albuminoid exudate into the vitreous body. I have since had such specimens following injury which had been fixed in formaldehyde. It looks to me like a general albuminoid exudate into the vitreous which had not become purulent. It is a condition which I have never observed in the living subject. Until a more satisfactory explanation can be found, I am inclined to rest on the theory of albuminoid exudate that either came on suddenly or was so formed that it created no inflammatory disturbance, not even sufficient to redden the conjunctiva.

The other three conditions possible, are tuberculosis, glioma, and entozoa. It has not the appearance of a glioma.

Dr. Barck: We do not know how long this condition has existed. It was discovered accidentally and the connection with the possible typhoid is a mere supposition. But one thing is certain, and that is the presence of cholesterin in the vitreous body. The glittering crystals of this substance cannot be mistaken. Furthermore, I believe the round and oval-shaped gray bodies, which we see floating around in the vitreous during the movements of the eyeball, to be colloid bodies, without making any more positive statement as to their origin. There seems to be no increased intra-ocular tension at present, which speaks against the probability of a tumor.

I do not recollect to have seen such a picture of the vitreous body before with the ophthalmoscope, but I have some specimens where the appearance of the vitreous body is quite similar. They are cases of infection of the vitreous body after perforating injuries. In them the entire vitreous body is transformed into floating masses of whitish-gray color. There is scarcely any yellowish tint such as we find in suppurative processes, but as these specimens have been lying for some time in formal solution, I am unable to say how much this may have to do with the color.

Dr. Post: The condition seems to me to be associated with the fever. There was probably a low-grade suppurative chorooiditis in the eye accompanied by an exudation into the vitreous body. This exudate gravitated into the lower portion of the vitreous chamber producing the condition we have here. In looking into the eye, a level surface can be seen stretching back a considerable distance from the front of the vitreous body, and this level surface moves up and down as the eye is moved about. There seems to be a number of small globular bodies resting on this level surface corresponding to those which we see in the vitreous body above.

It does not impress me as a case of tumor, but as one of those suppurative processes occurring in various parts of the body following low fevers. I am inclined to think this is the condition and that we may possibly find it to clear up in the course of time.

CONCUSSION CATARACT WITH RECOVERY.

By Dr. J. W. Charles.—On January 15, 1910, a boy, eight years of age, was brought to me with the statement that while coasting his forehead was struck by a sapling lying horizontally. The eye became red and the mother consulted her practitioner who used drops to dilate his pupils. Without correction, his vision was O.D. 10/120, O.S. 10/120; also with stenopaic disc ophthalmometer gave for both eyes As 0.75, M. vertical. The pupils were large and responded only slightly to light. Oblique illumination and the ophthalmoscope showed both lenses clouded by not only a few striations but a very distinct diffuse opacity resembling zonular cataract. The fundi were normal as far as could be seen. His conjunctiva was treated for several days and on the 18th, O.D. V. 10/120, O.S. V. 19/120, not improved by glasses.

The patient was taken South by his mother and I heard nothing further from him until word reached me that I was severely criticized for having made a mistake in diagnosis because he did not have cataract and that the eyes were normal. Dr. Ewing has kindly allowed me the use of his notes for the completion of this history. In May, five months after the injury, O.D. V. 20/15, O.S. V. 20/15, and the media and fundi were normal.

Although the child's vision was so low and the lens-opacities were demonstrable to the mother, the fact that I spoke of the

possibility of an operation in the distant future if the lenses did not clear up has caused the mother to believe that I made an unpardonable mistake.

Certainly, if a child were brought to the ophthalmologist with such a condition, he would feel inclined to tell the parent not to expect much chance for the better because the great majority of these cases are congenital and do not retrogress.

Many cases of reabsorption of traumatic cataracts have been reported and one would expect to make a guarded prognosis in the event of a blow on the eye, but when only the head had been struck without a history or manifest signs of injury to the eye, it was natural to think of the condition as congenital. Even lenses with commencing senile cataract have been found clear several years after. This opacity was not the ring-form opacity of the anterior surface described by Vossius in 1906, as resulting from contusions of the globe, but it more nearly resembled the ordinary faint forms of zonular cataract.

In the last number of the *American Journal of Ophthalmology*, Dr. Shoemaker reports from the *Journal of the A. M. A.*, the views of Clapp concerning the autolysis of the lens fibres in the absorption of broken and opaque cells, and concludes that the lens of the youth is more "easily liquified and absorbed because there is less of the insoluble albuminoid present and the enzymes are all active. In the aged, on the contrary, there is a much larger amount of the insoluble portion and all of the enzymes are relatively weak." While he is evidently speaking of actual rupture of the capsule and entrance of the aqueous, one can readily suppose a somewhat similar process in a case of mild contusion where fibres may be supposed to be bruised and temporarily opaque.

DISCUSSION.

Dr. Ewing: The patient Dr. Charles has referred to, consulted me in May of last year with the story that the boy had cataract. I examined very carefully every portion of each lens and was doubly cautious because of the mother's being so positive in her statement. There were no pathological changes in either lens. The vision in each eye was normal. I told the mother that she must have misunderstood Dr. Charles; he had probably said that cataract might develop from such an injury.

Until Dr. Charles spoke to me recently about the case, I was not aware that lens changes had actually existed.

Dr. Barck: I have seen, as everybody has, cases of traumatic cataract where the rent in the capsule was very small and closed again; the cataractous area did not progress but cleared up by and by. Such cases are not very rare, but have never seen a case of congenital cataract which cleared up spontaneously.

I should like to add a brief remark in reference to Dr. Woodruff's case. These metastatic affections after typhoid fever or any other general infectious disease, are usually termed "metastatic choroiditis." The choroid in such cases is not primarily affected; it may be the ciliary body but I believe that the metastasis takes place primarily in the vitreous body. In it most of the pathological changes are found. I possess one interesting specimen in this respect; a suppurative process in the vitreous body secondary to purulent cerebrospinal meningitis, in which the choroid does not show any changes, and the ciliary body is hyperæmic only. I believe that in cases of intraocular metastases after general infectious diseases, we have to deal with a direct infection of the vitreous body.

Dr. Post: Dr. Charles's case is certainly very interesting. It would seem possible that if the nutrition of the lenses were interfered with by the violence of a blow, there might be sufficient changes in the lenses to be apparent, but as the effects of the blow were recovered from, the nutrition might be re-established and the lenses thus regain their transparency. It may be something we have never seen, and we may see something tomorrow we have never seen before. This case ought to make us careful in our prognosis when we meet with a traumatic cataract where there is no other evidence of trauma in the lens except the loss of transparency. As has been said, there are a good many cases reported where portions of the lens have become opaque and have later cleared up, and this case differs from these only in that the changes were more extensive. I think there is nothing improbable in this case.

THE OPHTHALMOLOGICAL SOCIETY OF THE
UNITED KINGDOM.

Tuesday, October 10th, 1911.

Mr. J. B. Lawford, President, in the Chair.

CARD SPECIMENS.

Mr. George Coats: Two cases of small sharply defined opacities of the cornea; opaque white rings; apparently in Bowman's membrane. The evidence as to their nature, congenital, degenerative, or traumatic was inconclusive.

Mr. N. Bishop Harman: A new photometer, specially devised for use in school medical work in measuring the illumination of desks, blackboards, etc., both in natural and artificial light. It gave a range of from 1 to 16 foot candles. The source of its comparative light was a standard sperm candle.

Lieutenant-Colonel L. J. Pisani: A case of cyst of the iris in a young woman, the anterior layer of which was so thin that it looked like a deep cavity; there was also some opacity deep in the cornea.

Major G. T. Mould: A case of vaccine pustule on the eyelid in a nursing mother.

Mr. R. A. Greeves: A case of tumor of the sclerotic. It dated from an injury by a tree twig. It had recurred after removal in spite of the use of carbonic snow and other caustics. Sections showed that it was an endothelioma.

Dr. F. E. Batten: A case of unilateral optic neuritis in disseminated sclerosis, occurring in a young woman. At the first appearance of the general symptoms the eyes were normal, but one failed suddenly five months later.

PAPERS—PRESIDENTIAL ADDRESS.

In his opening remarks Mr. Lawford expressed his gratitude to the members of the Society for the honour they had conferred upon him. It had been his privilege to know personally all the Presidents of the Society since its foundation in 1880; they had all gained his admiration and respect not only by their eminence in their profession but also by the admirable qualities they had

displayed as Presidents. In succeeding to the chair he was fully conscious of his inability to attain to their standard of excellence, although in one respect he felt able to claim equality with them; that was in his loyalty to the Society and in his deep and abiding interest in its welfare. In his endeavor to promote the best interests of the Society he was confident that he could rely upon the help and co-operation of every member.

For his introductory address Mr. Lawford chose the subject of Inoculation-Therapy in Diseases of the Eye. In a short historical account of the development of this branch of medical science, he alluded to the early method of protective inoculation against smallpox; to Jenner's discovery of vaccination and the systematic employment of this prophylactic measure; to the work of Pasteur, nearly a century later, in the methods of immunization of animals against chicken cholera and anthrax, followed in a few years by his successful use of anti-rabic vaccines; and to the steady progress which has been made since that date in the discovery of the microbes of disease and the employment of serums and vaccines in combating them.

Mr. Lawford then dealt chiefly with the experimental side of the subject, and gave an account of the results obtained by recent researches into the natural immunity possessed by the avascular tissues of the eye, the cornea, the aqueous and vitreous humors, and the possibility of influencing this immunity by serum and vaccine treatment. These experiments have shown that these structures share to a very slight extent in natural immunity, and that the highest degree of artificial immunity which can be conferred upon them is extremely small. The entrance of antibodies into the aqueous and vitreous can however be materially assisted by tapping the anterior chamber; the aqueous secreted after paracentesis contains a very much larger percentage of antibodies than is found in the aqueous first withdrawn.

Mr. Lawford also dealt with the varieties of serums and vaccines now employed, alluding to the differences between anti-toxic and anti-bacterial serums; to some of the important precautions to be observed in the choice and preparation of vaccines; to the essential differences between active and passive immunization, and to the question of specific and non-specific serum therapy, expressing the opinion that hitherto the results of non-sepecific serum therapy have shown it to be of little value.

In concluding his address Mr. Lawford said: "With the single exception of diphtheria antitoxin, therapeutic serums, antitoxic or antibacterial, have proved rather disappointing in the treatment of diseases of the eye. The results of treatment by vaccines on the other hand have been very encouraging. In tuberculous affections of the eye, in the ocular manifestations of systematic gonococcal infection, in streptococcal and staphylococcal infections of the conjunctiva, lacrimal sac and eyelids, in rare cases of infection by pyogenic bacilli such as *pyocyaneus*, *subtilis*, and *coli communis*, specific vaccines have proved most valuable therapeutic agents. There is little doubt that further knowledge and experience will enhance their value by enabling us to employ these and similar therapeutic measures more accurately and scientifically, and less empirically, than is now possible."

Mr. Lawford thought it would be fitting that he should briefly refer to the death of one of the Society's most distinguished members, Dr. Hughlings Jackson. By his death the Society and the profession throughout the kingdom, and indeed over the whole world, had sustained a great loss. Dr. Jackson was one of the Society's original members, and in the early days took a keen and active interest in its proceedings. He was one of the first Vice-Presidents, and served in that office on two occasions. During the Session 1889-90 he filled the Presidential Chair, to the great gratification of the then members. Except to the younger members of the Society, it was scarcely necessary that he, Mr. Lawford, should say anything about the merits of Dr. Jackson; he was a man of unusual natural ability, with very highly-developed powers of observation, and with the mind of a philosopher. Added to this, he had an extraordinary faculty for work, and it was not surprising that these qualities placed him in a foremost position amongst his contemporaries. Dr. Jackson was one of the pioneers of modern neurology, and neurologists owed a great deal to him. He was one of the earliest—perhaps the earliest—of physicians to recognize and teach the great value of ophthalmoscopic examination in diseases of the nervous system. Like most men of great natural ability, he was extremely modest and retiring; but to those who were intimate with him he was one of the most charming of men. He had

left behind him a personal and professional reputation to which any man might aspire, but to which very few men could hope to attain. The world and the profession were poorer by his death, and many of the members present had to mourn the loss of a valued friend.

A Case of Hereditary Cataract.—Dr. J. S. Manson, communicated by Mr. Nettleship.

This was a case of hereditary cataract occurring in four consecutive generations, affecting 13 persons (6 males and 7 females), and transmitted in all cases by females who were themselves affected. Three members of the pedigree, in three different generations, had a congenital deformity of the little fingers, which appeared to have been independent of the cataract, for only one individual showed both the digital and lenticular abnormality.

A New Pedigree of Hereditary Night-blindness.—Mr. Nettleship.

The genealogy was extensive and embraced 20 affected males, and possibly one affected female. Careful examination of the fundus oculi of affected members showed no pathological changes, but the abnormality was associated with myopia. Photometric records showed feeble light sense, and perimetry contracted fields, and in one case there was a crescent scotoma extending from the disc. Consanguinity only occurred in one case. The inheritance descended through normal females.

ABSTRACTS FROM MEDICAL LITERATURE.

By J. F. SHOEMAKER, M.D.,

ST. LOUIS, MO.

THE RELATION BETWEEN DISEASES OF THE EAR AND THOSE OF THE EYE.

Dunbar Roy (*Jour. A. M. A.*, Sept. 30, 1911) discusses this subject under two heads: First, affections of the eyes which have been considered the cause of certain aural disturbances; and second, affections of the ear which have been attributed as the cause of certain ocular disturbances. Reference is made to the exhaustive article of Rohrer, in which is urged the ingenious relationship between the eyeball and middle ear. "Ostmann," he says, "in 1907, called attention to the fact that the eye is much more commonly affected by the ear than vice versa. Affections between these organs may be induced through reflex radiation and combined stimulation of the motor fibers or indirectly through otitic diseases of the brain and cerebral meninges. The nerve tracts which permit these relations between the eye and the ear according to this author are—the trigeminal, facial and acoustic nerves, the latter giving rise to a great variety of reflex effects on the eye according to the involvement of the vestibular branch (static function) or the true auditory nerve, the cochlear branch. Both the eye and ear are abundantly supplied with sensory fibers from the trigeminus, accounting for the pain in the eye that is felt in severe middle ear suppuration. The facial nerve establishes a communication between the eye and the ear by enervating the stapedius muscle on the one hand, and the orbicularis palpebrarum on the other. It is for this reason that a deep, humming sound in the ear is perceived on tightly shutting the eyelids, which is interpreted as a muscular bruit originating from the stapedius."

Under the first heading he mentions such disturbances as the following: ringing in the ear when nose glasses are worn; when glasses are removed the noise disappearing. Aural tinnitus due to muscular imbalance in the eyes, cured by graduated tenotomies. Tinnitus, muffled and stuffy sounds and even verti-

go relieved by correction of errors of refraction. Tinnitus caused by the examination of the eye with the ophthalmoscope: Deafness, lasting two hours, following the looking at a Volta light for a few minutes. Tinnitus and deafness caused by the irritation of an eye from a chip of iron being driven into it, but which was extracted. Complete relief the next day after enucleating the injured eye. Tinnitus, vertigo and deafness caused by an inflamed and irritable eye following cataract extraction. Tinnitus and vertigo relieved by the enucleation of the eye which had remained inflamed, but the hearing continued defective. Deafness in the right ear following an injury of the right eye by being struck by a ball.

These disturbances evidently are the result of severe reflex irritation and not of any direct pathologic relationship.

Under the second heading reference is made to reported cases of: persistent twitching of the eyelid cured by a single air douche of the middle ear; the cure of a ptosis after the removal of an ear polyp; blepharospasm caused by a plug of cerumen in the auditory meatus, and also by the introduction of an ear speculum. Paralysis of both the extrinsic and intrinsic muscles of the eye, arising from affections of the ear, particularly middle ear diseases, are quite common. The explanation of these ocular disturbances is not certain. Some attribute it to reflex disturbances, other to infectious neuritis due to toxins produced by ear infections and still others to direct spreading of an infectious lesion. Much has been said in recent years concerning the occurrence of nystagmus in middle and internal ear diseases, and it is now fairly well established that nystagmus is produced through irritation of the semi-circular canals.

The author says in conclusion: let me urge otologists as well as ophthalmologists to bear in mind these relations of which I have spoken, for my own observation leads me to believe that many mistaken diagnoses have been made by not considering the interdependence of the various organs of the body.

BLINDNESS FOLLOWING THE ADMINISTRATION OF ORGANIC ARSENIC.

A. W. McAlester (*The Jour. Mo. State Med. Ass.*, October, 1911) has reviewed the literature on the subject of organic arsenic, mentioning, among the drugs of this class used, atoxyl,

arsacetin, soamin, orsudan, sodium cacodylate and salvarsan. Atoxyl seems to be the most toxic of the group, optic atrophy occurring in about 2 per cent. of the cases where it has been used, while it would appear that so far as the eyes are concerned sodium cacodylate is the least toxic, it being the only arsenic compound that has not caused blindness, so far as the author knows. He says in conclusion that from the combined reports he gathers the following:

The toxic effect of all these compounds is somewhat different from that of the inorganic arsenic, the chief clinical manifestations of which are tinnitus, deafness, vomiting, pain and anuria. With "606" eruptions resembling scarlatina may appear with the development of a temperature that may rise to 104. This usually occurs from the eighth to the tenth day, and resembles the effect of serum treatment; the effect of the antigen creating the toxins. The field of vision becomes contracted first, more so on the nasal side, blindness finally resulting. The process is that of quinin amblyopia without the recovery.

Ophthalmoscopically there are to be seen fine vitreous opacities, narrowing of the arteries and finally a typical picture of optic atrophy. The progress of the atrophy varies from a few weeks to a year or more.

It appear that the previous use of arsenic predisposes the individual to the influence of other arsenic compounds. Waterman thinks that tabetic-atrophy, alcohol, mercury and arsenic render the patient more liable to arsenic-amblyopia.

There is little to be gained from the study of the dosage or the method of administration. It cannot be decided from the data in hand whether bad results are from too great single doses or from making them too close together, or giving too much in toto. From existing data one can arrive at any conclusion, but it seems that the small, often repeated dose is the most dangerous. It may be because this has been the usual method of administration. As Schrimmer and Beck point out, it is uncommon for two doses following each other at short intervals to produce blindness; still it does, and it is much safer to give one large dose, Ehrlich's "*dosis magna sterilisans*," than small, often repeated doses. The amount of the dose of these substances varies as the toxicity varies. Some patients have stood enormous doses of atoxyl, while atrophy has followed eight doses of 0.1 gm.

BRAIN TUMOR.

REPORT OF NINE CASES.

Sherman Voorhees (*Jour. A. M. A.*, July 29, 1911) believes that too much dependence should not be placed upon the presence or absence of choked disc, in making the diagnosis of brain tumor. He thinks some cases are not recognized because of the absence of this sign. In the early stages of optic nerve changes the swelling is often so slight that it would not be classified as choked disc. In some cases typical choked disc develops later while in others it does not. Another misleading factor may be the coincident occurrence of changes in the macular region, with perhaps some albumin in the urine, with or without the presence of casts or other evidences of nephritis. In such cases a superficial examination might easily lead to the diagnosis of albuminuric retinitis. Albuminuric retinitis, however, is generally a later symptom of nephritis and the macular changes in brain tumor occur with the height of the swelling. Moreover, the macular changes in brain tumor are not like those of typical albuminuric retinitis, so that they should be differentiated. Brain tumor and nephritis may sometimes occur in the same individual, a fact which should be remembered. In such cases other symptoms of tumor must be sought. Amaurosis is an important symptom and occurs in the majority of cases. Another symptom of great value is deafness, either partial or complete, of one ear. This appears early in the majority of cases of tumor of the cerebellum and angle. When present it assists in localizing the side of the lesion. Vomiting, another symptom, comes on without previous nausea and is expulsive in character. It often occurs at night. Reference is made to the reversal and interlacing of the color lines in the visual fields, as described by Cushing and Borley, which, if found to be constant before the visible nerve changes, will assist greatly in the diagnosis. Voorhees has noticed one symptom in several of his patients which he has not seen reported by writers, viz.: the loss of sense of distance and direction for objects. Such patients missed articles they attempted to reach, either not reaching far enough, over-reaching or going to one side. He believes that ophthalmologists should be as familiar with the symptomatology of brain tumor

as the internist or surgeon, since there is no one symptom which is sufficient upon which to make the diagnosis, and patients frequently consult the ophthalmologist first on account of temporary amaurosis or the failure of vision due to optic nerve changes. He urges the value of operation by decompression and removal of the tumor, if possible, even in cases where vision has been practically lost, since it frequently relieves the other symptoms greatly and adds much to the patient's comfort. Nine cases are reported by the author illustrating the more common symptoms of this condition.

NOTICE.

The first Course on Ophthalmology to be given by the University of Colorado, in Denver, will begin June 23rd and extend to August 2nd, 1912. The instruction will be open to all graduates of accredited medical colleges. But those desiring to take a degree will be required to show one year of work in an eye clinic, besides a certain amount of mathematics and physical optics, an acquaintance with the literature of ophthalmology, and to pass an examination.

BOOK REVIEWS.

INJURIES OF THE EYE.. A practical hand-book of diagnosis and treatment with special references to forensic procedures and visual economics. By H. V. Würdemann, M.D. Thoroughly illustrated with original drawings, photographs and colored plates. Chicago, Cleveland Press. 1912.

The want of a modern book on eye injuries in the English language prompted the well-known author to gather together what he could find in literature and to add to it the large material from his own experience to give the profession such a book. He has succeeded admirably. The thirty-three chapters cover the ground completely. If there is any fault to find, it is that the book contains more than it seems would have been necessary to serve its original purpose. It is quite profusely illustrated, thus giving the student a welcome picture of the conditions described in the text.

The presswork is well done. Misprints are, however, not wanting especially in the quotations from foreign languages. The opportunity to correct these will, we hope, soon be given by the necessity of a second edition, as we doubt not that the work will be highly and generally appreciated.

RETINOSCOPY IN THE DETERMINATION OF REFRACTION AT ONE METER DISTANCE, WITH THE PLANE MIRROR. By James Thorington, A.M., M.D. 6th Edition, revised and enlarged. 61 illustrations, 10 of which are colored. Philadelphia. P. Blakiston's Son & Co. 1911. Price \$1.00.

This excellent little book intended as an introduction for students and practitioners comes to us in its sixth edition. This fact alone shows how well it fills its place. We can only recommend it again, as before, on account of its clear, concise diction and its completeness.

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